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Water Quality Factors

NORTH PLATTE RIVER

Wyoming-Nebraska

October 1971

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Water Quality Factors
North Platte River
Wyoming - Nebraska

Prepared by
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16. Abstracts

The North Platte River is an interstate stream, flowing from Wyoming into Nebraska. This paper summarizes applicable water quality regulations, the history of enforcement actions, existing sources of pollution and water quality conditions for the reach of North Platte River extending from Fort Laramie, Wyoming to Broadwater, Nebraska.

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INTRODUCTION

The North Platte River is an interstate stream, flowing from Wyoming into Nebraska. As the river flows through the North Platte Valley, water quality is degraded by municipal and industrial waste discharges and by agricultural pollution including irrigation return flows. Water quality degradation was most severe prior to 1961. In 1961, a Federal-State Enforcement Conference was held to consider the interstate pollution of the North Platte River by Wyoming waste sources. Water quality studies subsequently undertaken as recommended by the Conference also examined Nebraska pollution sources. Improved treatment practices were effected at a number of waste sources and substantial enhancement of water quality was achieved.

Water quality standards were established for the river in 1967 by Wyoming and Nebraska in accordance with the Water Quality Act of 1965. These standards specified water quality criteria which the existing waste treatment facilities could not meet in all cases. A December, 1970, stream survey confirmed that waste discharges from the Holly Sugar Corporation sugar beet refinery at Torrington, Wyoming, were causing violations of the Nebraska water quality standards. A 180-day notice was issued to Holly Sugar Corporation on June 15, 1971. A hearing was held on July 21, 1971, and stringent waste treatment requirements were established for the Holly Sugar Corporation discharge.

It is believed that sources of pollution in Nebraska are also causing significant water quality degradation in the North Platte River and may be causing violations of standards. The Region VII office of EPA in Kansas City, Missouri, has requested DFI-DC to conduct an investigation of waste

sources and water quality conditions in the North Platte Valley during the 1971-72 sugar beet processing season.

This paper summarizes applicable water quality regulations, the history of enforcement actions, existing sources of pollution and water quality conditions for the reach of North Platte River extending from Fort Laramie, Wyoming to Broadwater, Nebraska.

SUMMARY AND CONCLUSIONS

1. The North Platte River is an interstate and navigable water subject to the provisions of the Federal Water Pollution Control Act, as amended and the Refuse Act of 1899.
2. Water quality standards have been established for the river by Wyoming and Nebraska and fully approved as Federal standards.
3. A December, 1970, water quality survey determined that violations of the Nebraska bacteriological criterion were occurring as the result of waste discharges from the Holly Sugar Corporation sugar beet refinery at Torrington, Wyoming.
4. A 180-day notice was issued to Holly Sugar Corporation on June 15, 1971. A hearing was held on July 21, 1971, and an implementation schedule established for pollution abatement activities. Complete abatement of pollution will be achieved prior to the start of the 1972-73 sugar beet processing season with substantial upgrading of waste controle to be implemented during the current season.
5. Four Great Western Sugar Company sugar beet refineries are located in Nebraska downstream from the Holly Sugar Corporation discharge. Waste treatment facilities in operation at the four plants will not meet

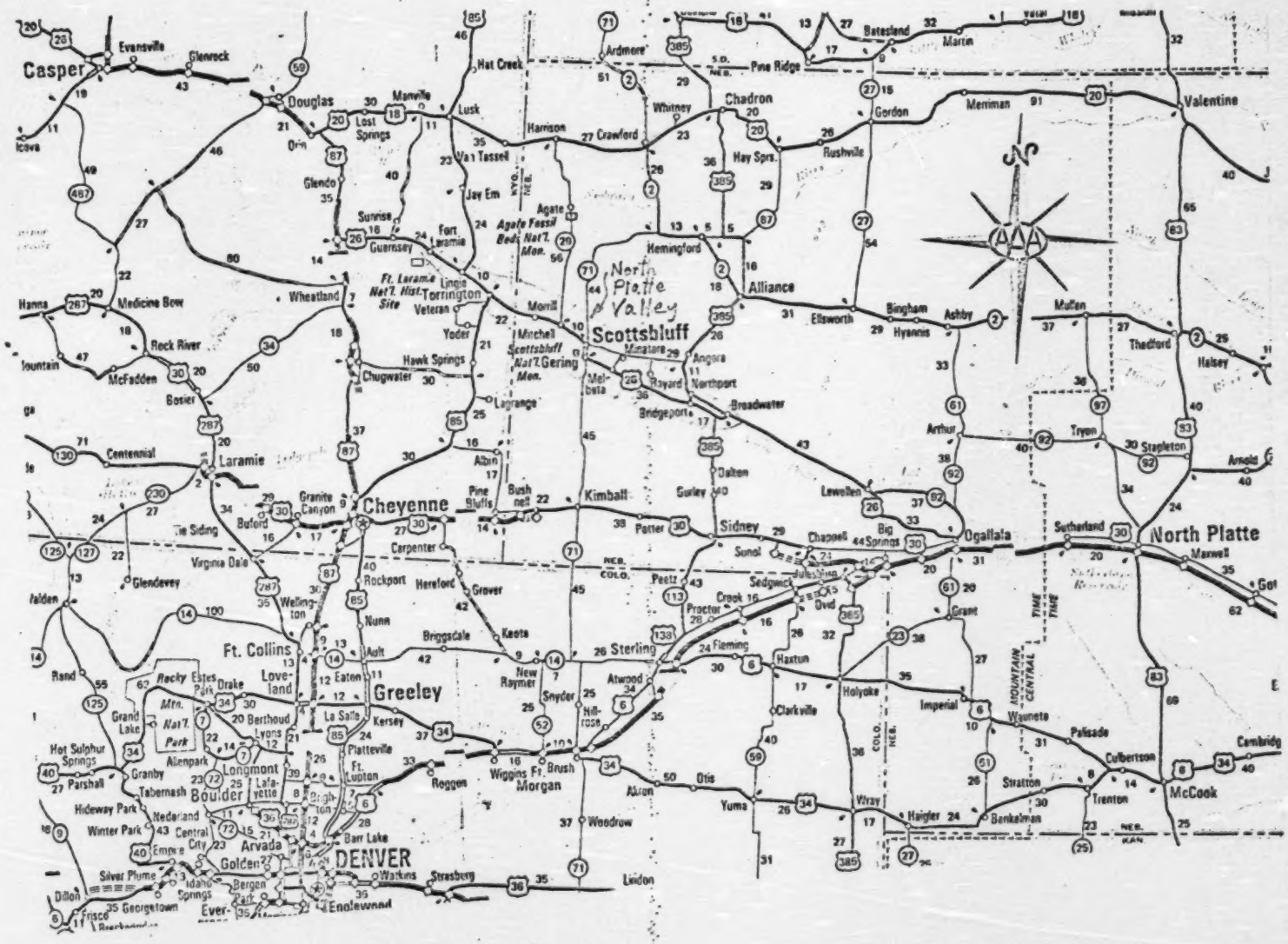

Figure 1. Location Map

the requirements imposed on the Holly Sugar Corporation plant.

6. A waste source and water quality survey of the North Platte River between Torrington, Wyoming and Broadwater, Nebraska, is needed during the sugar beet processing season to define the impacts of waste sources on water quality, to evaluate present waste disposal practices, and to define waste treatment needs.

DESCRIPTION OF AREA

The North Platte River originates in Colorado, flows through Wyoming, and joins the South Platte River at North Platte, Nebraska, to form the Platte River. The reach of the river of interest in this paper is located in the North Platte Valley which extends from Fort Laramie, Wyoming to Broadwater, Nebraska, a distance of about 100 miles. (See Figure 1)

A large area of irrigated farmland is the predominant characteristic of the North Platte Valley. The valley extends for about 100 miles in length with widths up to 20 miles. Much of the area is irrigated by the Bureau of Reclamations North Platte Project. Substantial areas are also served by private irrigation systems. About one-fourth of the irrigated area is in Wyoming with the remainder in Nebraska. Three large interstate canals, the Fort Laramie, Mitchell-Gering and Interstate Canals, serve the Valley.

The North Platte River upstream from the valley is highly regulated by a number of large reservoirs. Stream flows are regulated to meet irrigation demands and water rights. Stream flows are maintained at relatively high levels at the upper end of the valley during the irrigation season.

Over half of the river flow is diverted into the canal system before it crosses the Nebraska state line. The river flow thus decreases as it moves downstream due to the irrigation diversions. Return flows increase the stream flow again toward the lower end of the valley. The annual mean flow in the North Platte River at the Nebraska state line is about 350,000 acre feet. An additional 500,000 acre feet of water flow into Nebraska from Wyoming by way of the three interstate canals and Horse Creek.

Scottsbluff, Nebraska, with a population of about 15,000, is the largest community in the valley. Gering, Nebraska, and Torrington, Wyoming, with populations of about 5,000 each are the only other communities with more than 2,000 population. Most of the population centers are located near the river.

Agriculture is the predominant industry in the valley. Irrigation crops of importance are sugar beets, alfalfa, corn and other feed crops. Livestock feeding, sugar beet processing and meat packing are important agriculture related activities.

APPLICABLE WATER QUALITY REGULATIONS

Water Quality Standards

Water quality standards applicable to the North Platte River, Horse Creek and three interstate canals in Wyoming were established by the Wyoming Department of Public Health in June, 1967, in accordance with provisions of the Water Quality Act of 1965. The standards were revised in October, 1968, and on November 27, 1968, were fully approved as Federal standards.

Wyoming designated the following water uses for stream reaches in the study area:

1. North Platte River - Fish and wildlife propagation, agricultural, industrial, limited body contact recreation, aesthetics and waste asimilation.
2. Horse Creek - Fish and wildlife propagation, agricultural, limited body contact recreation and aesthetics.
3. Interstate canals - Agricultural.

Specific water quality criteria applicable to the above waters were also established. These criteria are summarized in Appendix A. Criteria of special interest include the minimum dissolved oxygen limit of 6.0 parts per million, the pH range of 7.5 to 8.5 and the fecal coliform limit of 2,000 per 100 milliliters (geometric mean of the last five consecutive samples). The last criterion is applicable only during the recreation season (May 1 through September 30).

In May, 1967, Wyoming indicated the interstate waters in the study area were in compliance with the standards subsequently adopted as Federal standards. All waste sources, including Holly Sugar Company at Torrington, were considered to be providing adequate treatment. Disagreement with the Nebraska coliform limit for the North Platte River immediately downstream from Nebraska was also indicated.

Water quality standards applicable to the North Platte River and Horse Creek in Nebraska were adopted by the Water Pollution Control Council in June, 1967 and subsequently approved as Federal standards on December 19, 1968. The initial standards were revised by the State on October 9, 1970.

These revisions received full Federal approval on June 28, 1971.

The North Platte River and Horse Creek were designated in water use classification "C". Waters in this classification are to be protected for partial body contact sports, growth and propagation of fish, waterfowl, furbearers, wildlife and other aquatic and semiaquatic life, agricultural uses including irrigation and livestock watering, industrial uses and aesthetics.

Water quality criteria applicable to these waters are summarized in Appendix B. Specific criteria of interest include the minimum dissolved oxygen limit of 5 mg/l in warm waters and 6 mg/l in trout waters, a pH range of 6.5 to 9.0 with maximum total change of 1.0 pH unit from the value in the receiving stream, and a coliform group limit of 10,000 total coliform or 2,000 fecal coliform organisms per 100 milliliters (geometric mean).

Nebraska also adopted the following treatment requirements:

"to protect and enhance the quality of productivity of the waters, all municipal wastes shall receive at least secondary treatment plus such additional treatment as is required to maintain Water Quality Criteria. All industrial wastes shall receive an equivalent degree of treatment or control consistent with waste characteristics, uses and quality of receiving waters."

"The objective of treatment or control will be to reduce the organic level, oil, grease, solids, alkali, acids, toxic materials, color and turbidity, taste and odor products and other deleterious materials to such a level as to meet the Water Quality Criteria contained in these Standards."

"The date for compliance with the requirements of these Standards for all municipal, industrial, and other waste which discharge into intrastate and interstate waters of the State, except for those waste sources discharging directly to the Missouri River, shall be January 1, 1972, with earlier compliance where necessary."

"Feedlot wastes shall be effectively controlled by no later than December 31, 1972, with earlier compliance where necessary."

The implementation plan submitted with the 1967 initial standards indicated improved treatment facilities were needed at three municipal and five industrial sources. The four Great Western Sugar Company sugar beet refineries were not listed in the plan. Current waste treatment needs are discussed in a later section on pollution sources.

Violations of water quality criteria have occurred as discussed below and other violations may be occurring.

Refuse Act Permit Program

Under provisions of the Refuse Act of 1899, recently given new status by the issuing of Executive Order No. 11574 by President Nixon on December 23, 1970, a major program has been undertaken cooperatively by the Corps of Engineers and EPA to issue permits for all discharges of industrial wastes to navigable waters. All industries discharging to navigable waters were required to apply for such a permit by July 1, 1971. The application submission included data on industrial processes, raw materials, products, waste flows and general information on waste characteristics. For certain critical types of industry, a second submission containing specific information on waste constituents was required by October 1, 1971. A lengthy

review process will proceed the issuance of permits which will specify conditions under which the discharge of industrial wastes may be allowed. Effluent criteria may be specified. The present status of permit applications from industries in the North Platte Valley is unknown at this time.

Enforcement Conference Requirements

Based on the results of water quality surveys of the North Platte River between Torrington, Wyoming, and Morrill, Nebraska, in November, 1960, which showed substantial interstate pollution of the river was occurring, the Conference on Pollution of the Interstate Waters of the North Platte River, Wyoming - Nebraska, was convened on September 12, 1961 in Scottsbluff, Nebraska. The Conference was initially called to consider the pollution resulting from the waste discharge from the Holly Sugar Corporation sugar beet refinery at Torrington, Wyoming. The scope of the Conference was expanded to include Nebraska sources of pollution of which the four Great Western Sugar Company sugar beet refineries were the most important.

As recommended by the Conference, various water quality and waste source surveys were conducted during the 1961-62 and 1962-63 sugar beet processing seasons to define water quality conditions and determine waste treatment needs. The Conference was reconvened on March 21, 1962, and November 20, 1963, to evaluate the results of the surveys, to determine the results that had been achieved in reducing water pollution, and to make further recommendations for pollution abatement.

During the period between the first and third sessions of the Conference, various waste treatment and control improvements were placed in operation by municipal and industrial waste sources and substantial enhancement of

water quality was achieved. In particular, Holly Sugar Corporation eliminated all waste discharges but flume water and provided fine screening for the flume water discharge in compliance with Conference recommendations. Great Western Sugar Company at Scottsbluff, the largest waste source in the Nebraska portion of the Conference area, ponded its entire waste discharge during the 1962-63 season. Waste treatment and control facilities were installed at other sugar beet refineries in compliance with conference recommendations by 1965. All municipal sources were in compliance with conference requirements by the end of 1968 with the exception of Bayard.

The recommendations of the three conference sessions have essentially been carried out. The establishment of water quality standards with more stringent limits on water quality than considered by the Conference thus become the controlling water quality requirements for the conference area.

Other Enforcement Actions

A water quality and waste source survey of the 10 mile reach of the North Platte River between Torrington, Wyoming, and Henry, Nebraska, in December, 1970, produced evidence that inadequately treated wastes from the Holly Sugar Company are still creating interstate pollution of the river and that violations of the Nebraska coliform criterion are occurring. Based on the results of this survey, a 180-day notice was issued to Holly Sugar Corporation on June 15, 1971. The Corporation was thus given until December 23, 1971, to take positive action to secure abatement of pollution or face court action.

A hearing was held in Scottsbluff, Nebraska on July 21, 1971, to consider the standards violations and means of achieving pollution abatement.

At the hearing, it was pointed out that Holly Sugar Corporation was also in violation of the Refuse Act of 1899.

The Region VII office in Kansas City, which conducted the 1970 survey and the hearing, recommended the following pollution abatement steps be taken by Holly Sugar Corporation (9):

1. Interim system prior to startup of the 1971-72 Sugar Beet Campaign.

   A. Separate condenser and transport systems.

   B. Install a closed loop system for recycle of transport waters. Any waters discharged from this system to the North Platte River should not exceed daily average effluent concentrations of 30 mg/l BOD_5 and suspended solids with no grab sample to exceed 50 mg/l.

   C. Interim provisions will allow separated condenser waters to be discharged directly to the North Platte River.

2. Complete system by start of 1972-73 Sugar Beet Campaign.

   A. Transport waters recycled via clarifier system. Solids recovered from clarifier should be dewatered and disposed of in a manner which will not create odor problems. Any supernatant from sludge dewatering should be returned to recycle system or treated to effluent concentrations not to exceed a daily average of 30 mg/l BOD_5 and suspended solids with no grab sample to exceed 50 mg/l if discharged.

   Any buildup (i.e. excess water) water generated in the transport water recycle system, as well as contents of the system at the end of the campaign, should receive whatever

treatment is necessary to produce an effluent concentration not to exceed a daily average of 30 mg/l BOD_5 and suspended solids with no grab sample to exceed 50 mg/l prior to discharge to the North Platte River.

B. Condenser water recycle via cooling device. Any discharge from this system to the North Platte should not exceed a daily average effluent concentration of 10 mg/l BOD_5 and suspended solids with no grab sample to exceed 20 mg/l.

C. Any wastewater discharge from the system, with the exception of uncontaminated cooling waters, should be effectively disinfected to assure compliance with applicable water quality standards.

Holly Sugar Corporation had waste treatment and control improvements underway with a scheduled completion date of January 1, 1972. An acceleration of this schedule will be made to comply with the recommended requirements.

Region VII also expects to require similar treatment to be provided by the four Great Western Sugar Company refineries in Nebraska. The Nebraska Water Pollution Control Council has indicated that EPA will have to prove that discharges of condenser water result in detrimental effects on the North Platte River before they will require the abatement of such discharges. This is in line with their requirement that industrial waste discharges receive the degree of treatment necessary to meet water quality criteria.

SOURCES OF POLLUTION

Within the area of interest, the North Platte River receives discharges of municipal and industrial wastes, irrigation return flows, feedlot drainage and rural runoff. All of these factors contribute pollution which degrades water quality in the North Platte River. The magnitude of municipal and industrial pollution is known. The magnitude and effects of the other types of pollution are not defined.

Municipal Waste Sources

There are a total of 17 municipal waste sources located in the three county study area as shown in Table 1. Only three sources -- Scottsbluff and Gering, Nebraska, and Torrington, Wyoming -- are of significant size. Scottsbluff, with an average discharge of 3.5 mgd, is by far the largest discharge. The actual discharges at Gering and Torrington are unknown but should be in the range of 1.0 mgd. All other sources probably discharge less than 0.2 mgd.

The three minor sources on Horse Creek should produce a negligible effect on the North Platte River due to their small size and distance from the river.

With the exception of Bayard, Melbeta and Terrytown, all municipalities discharging to the North Platte River treat their wastes in oxidation lagoons. Bayard provides no treatment while Melbeta wastes are treated in a clarifier followed by a sand filter and Terrytown operates an extended aeration treatment facility. The STORET inventory indicated that only Terrytown chlorinates its effluent.

All but four of the present waste treatment facilities were constructed

TABLE 1

MUNICIPAL WASTE SOURCES

No.	Municipality	Population Served	Design Flow (MGD)	Treatment	Receiving Stream	River Mill
			MORRILL COUNTY, NEBRASKA			
1.	Bayard	1500	-	None	Bayard Canal to N. Platte River	155
2.	Bridgeport	2000	0.19	Lagoon	N. Platte River	142
3.	Broadwater	160	-	Lagoon	Sump to N. Platte River	127
			SCOTTSBLUFF COUNTY, NEBRASKA			
4.	Gering	5000	1.79	Lagoon	N. Platte River	173
5.	Henry	80	0.01	Lagoon	N. Platte River	199
6.	Lyman	350	0.09	Lagoon	Horse Creek	194/3.5
7.	Melbeta	80	0.01	Primary and Sand Filter	N. Platte River	166
8.	Minatare	800	0.08	Lagoon	N. Platte River	166
9.	Mitchell	1800	0.16	Lagoon	N. Platte River	184
10.	Morrill	950	0.15	Lagoon	N. Platte River	191

TABLE 1 (cont'd)

MUNICIPAL WASTE SOURCES

No.	Municipality	Population Served	Design Flow (MGD)	Treatment	Receiving Stream	River Mill
			SCOTTSBLUFF COUNTY, NEBRASKA (cont;d)			
11.	Scottsbluff	15000	3.50*	Lagoon	N. Platte River	173
12.	Terrytown	750	0.22	Extended Aeration	N. Platte River	174
			GOSHEN COUNTY, WYOMING			
13.	Fort Laramie	350	-	Lagoon	N. Platte River	230
14.	Hawk Springs	125	-	None	Horse Creek	-
15.	La Grange	175	-	Under Construction	Horse Creek	-
16.	Lingle	500	-	Lagoon	N. Platte River	219
17.	Torrington	5000	-	Lagoon	N. Platte River	209

* Average daily flow - design flow unknown.

since the first session of the enforcement conference in 1961. Melbeta, Fort Laramie, Lingle and Torrington had previously completed waste treatment facilities.

The Nebraska implementation plan calls for Bayard to complete a secondary treatment facility and for Melbeta to upgrade their existing facility to secondary treatment by January 1, 1972. Terrytown was also included in the implementation plan and has completed a new facility as discussed above.

Industrial Waste Sources

In 1961, there were 14 known sources of industrial wastes discharging to the North Platte River between Torrington and Broadwater[6]. Only one source, the Holly Sugar Corporation, was located in Wyoming. Five of the sources were sugar beet refineries which discharged a total waste load with a BOD population equivalent of about 1.5 million. In contrast, the nine other industries discharged a total waste load with a BOD population equivalent of only 43,000. Improved treatment and control measures have substantially reduced the BOD load from both the sugar beet refineries and other industries. Present waste treatment and disposal practises at the sugar beet refineries are not considered adequate. The adequacy of treatment at other sources is not defined.

Existing industrial waste discharges listed in the STORET inventory are summarized in Table 2. These sources include the five sugar beet refineries and two meat packing plants in Scottsbluff that are now connected to the municipal treatment system. The locations of the sugar beet refineries are shown in Figure 2.

TABLE 2

INDUSTRIAL WASTE SOURCES

No.	Industry	Location	Type Industry	Flow (MGD)	Receiving Stream	River Mill
1.	Flicker Packing Co.	Scottsbluff	Meat Packer	-	Scottsbluff Sewer System	173
2.	Great Western Sugar Co.	Bayard	Sugar Beet Refinery	2.95	Ditch to N. Platte River	150/2.0
3.	Great Western Sugar Co.	Gering	Sugar Beet Refinery	6.00	Ditch to N. Platte River	173/1.5
4.	Great Western Sugar Co.	Mitchell	Sugar Beet Refinery	1.05	Ditch to N. Platte River	184/1.5
5.	Great Western Sugar Co.	Scottsbluff	Sugar Beet Refinery	4.45	Ditch to N. Platte River	173.8/3.0
6.	H and B Packing Co.	Scottsbluff	Meat Packer	-	Scottsbluff Sewer System	173
7.	Holly Sugar Corporation	Torrington	Sugar Beet Refinery	5.90	N. Platte River	208.8

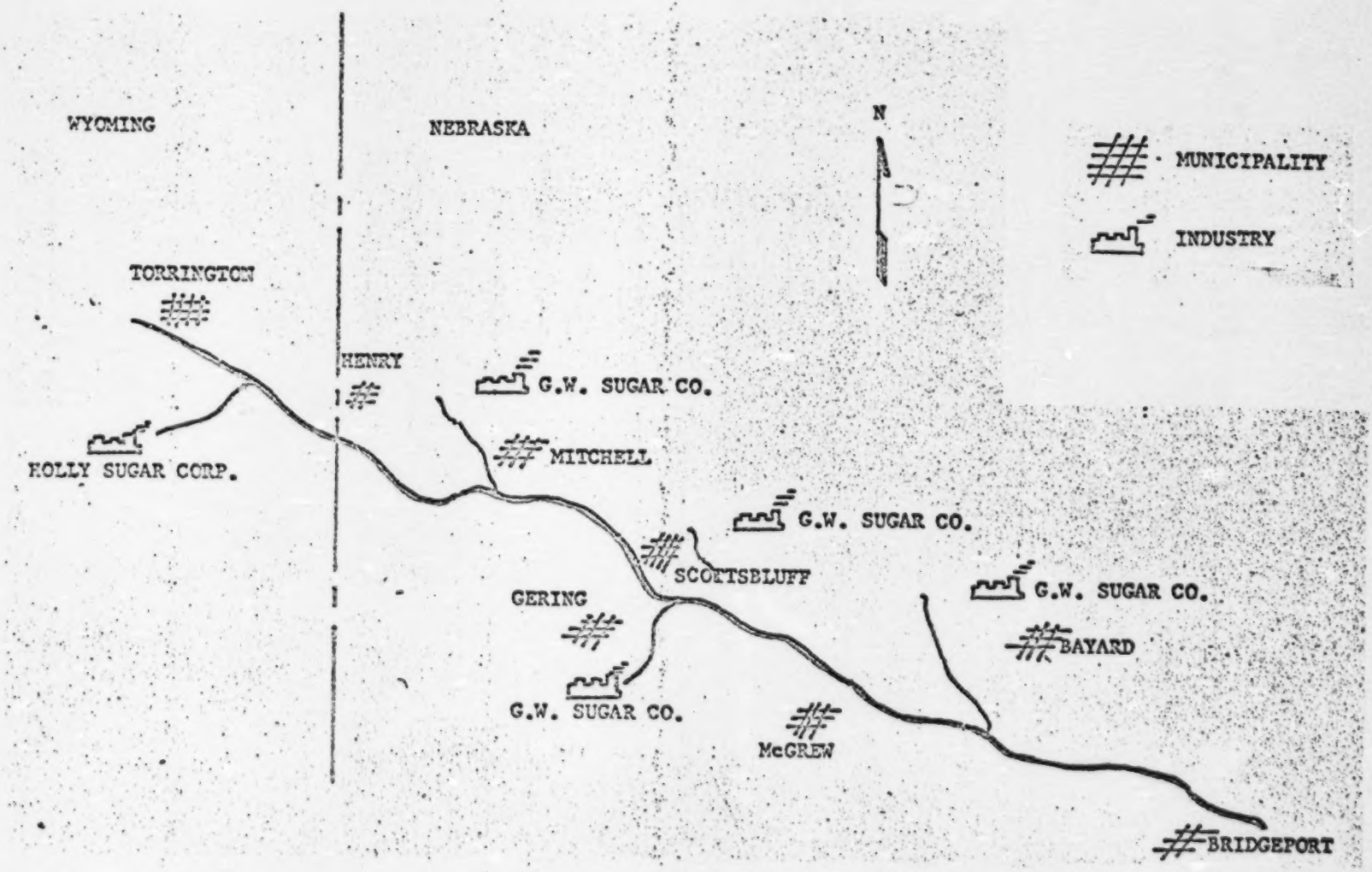

Figure 2. Location Sketch for Sugar Beet Refineries

The 1967 Nebraska implementation plan did not list the sugar beet refineries as requiring treatment improvements but did list five industries which were required to provide a private treatment facility or connect to a municipal treatment system by January 1, 1972. Two of these sources were the meat packing plants listed in the STORET inventory. These sources have complied with the implementation plan requirements. The three other sources listed in the implementation plan but not in the STORET inventory were the Platte Valley Poultry Marketing Company at Henry and the Hersch Packing Company and Swift and Company, both at Scottsbluff. The status of these waste sources is unknown.

Four industrial waste sources existing in 1961 were not list in the Nebraska implementation plan or the STORET inventory. These were the Co-op. Oil Refinery, Idlewild Dairy and Scottsbluff Rendering, all at Scottsbluff, and the Miller Packing Company at Gering. The present status of these waste source is unknown.

A number of changes have been made in waste disposal practices at the various sugar beet refineries since the 1961 conference. Some of these resulted in reductions in waste loads discharged while others resulted in increases. An example of the latter case is the Holly Sugar Corporation plant which had eliminated its discharge of condenser water by 1963 but is again discharging condenser water. A detailed source survey is needed at each refinery to fully define waste disposal practices and to assess the adequacy of treatment provided.

Agricultural Pollution

The North Platte Valley supports an important agricultural economy. Much of the valley is irrigated. Return flows from the irrigated areas can contain substantial loads of silt, fertilizers, pesticides and oxygen demanding materials. The effects of irrigation return flows on water quality conditions in the North Platte River are unknown.

A number of animal feedlots containing significant populations of cattle and other meat animals are scattered throughout the valley. Surface runoff and drainage from feedlots can carry substantial loads of nutrients, oxygen demanding materials and bacterial pollution. The significance of feedlots as a pollution source in the valley is not defined.

WATER QUALITY PROBLEMS

A number of water quality surveys were undertaken on the North Platte River during the 1960-63 period surrounding the enforcement conference. These surveys revealed that water quality in the river was degraded from Torrington, Wyoming, downstream to Broadwater, Nebraska. In 1960 and 1961, prior to substantial reductions in waste loads from the sugar beet mills, severe degradation occurred during the sugar beet processing season throughout the reach. Water quality conditions were characterized by high BOD levels (a maximum of 61 mg/l below the Holly Sugar Corporation), depressed dissolved oxygen levels (minimum levels of 4.3 mg/l or about 40 per cent of saturation occurred downstream from Scottsbluff), high suspended solids and turbidity, and high bacterial counts (over 1 million total coliforms/ 100 ml below Scottsbluff). Water quality observed during the rest of the year was relatively good.

The high waste loads being carried by the river had an adverse impact on aquatic life. Silt and organic sediments settled out on the river bottom smothering benthic organisms. Heavy growths of sphaeratilus occurred. Some of these growths were attached to aquatic organisms which caused further reductions in aquatic organisms. In some areas, very few fish food organisms were present. In the stream reaches carrying the heaviest loads of sugar beet wastes, fish could survive only by taking refuge in clear water areas where drains or tributaries entered the river.

During the 1962 sugar beet processing season, a waste load reduction of about 80 percent was achieved by the refineries. The effects on water quality were marked. BOD and suspended solids levels were substantially reduced. Dissolved oxygen depressions were very minor. However, bacterial counts remained high. Damage to aquatic life was substantial although not as severe as in the past.

Water quality data submitted by Nebraska with their water quality standards indicated that high bacterial counts were still present in 1965[10]. A survey of the river between Torrington and Henry in late 1970 indicated that bacterial counts were still high and in violation of Nebraska standards. It is probable that some damage to aquatic life is also occurring at present.

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APPENDIX A

WYOMING WATER QUALITY CRITERIA
Applicable to the
North Platte River

WYOMING WATER QUALITY CRITERIA APPLICABLE TO THE NORTH PLATTE RIVER

1. Settleable Solids. Essentially free from substances of other than natural origin that will settle to form sludge, bank or bottom deposits.

2. Floating Solids. Essentially free from floating debris, oil, grease, scum, and other floating materials of other than natural origin in amounts sufficient to be unsightly.

3. Taste, Odor, Color. Essentially free from substances of other than natural origin which produce taste, odor, or color that would:

    a. of themselves or in combination, impart an unpalatable or off-flavor in fish flesh

    b. visibly alter the natural color of the water, or impart color to skin, clothing, vessels or structures

    c. produce detectable odor at the site of use

    d. directly or through interaction among themselves, or with chemicals used in the existing water treatment process, result in concentrations that will impart undesirable taste or odor to the finished water.

4. Toxic. Free from toxic, corrosive, or other deleterious substances of other than natural origin in concentrations or combinations which are toxic to human, animal, plant or aquatic life. This standard is not intended to interfere with the use of approved fish toxicants under the supervision of the Wyoming Game and Fish Commission for fish management purposes.

5. Radioactive. Radioactive materials of other than natural origin shall not be present in any amount which reflects failure in any case to apply all controls which are physically and economically feasible. In no case shall such materials exceed the limits established in the 1962 Public Health Service Drinking Water Standards or 1/30 (168 hour value) of the values for radioactive substances specified in the National Bureau of Standards Handbook 69.

6. Turbidity. Turbidity of other than natural origin shall not impart more than a 15 turbidity unit increase to the water when the turbidity of the receiving water is 150 units or less, or more than a 10% increase when the water turbidity is over 150 turbidity units.

7. Dissolved Oxygen. Wastes of other than natural origin shall not be discharged in amounts which will result in dissolved oxygen content of less than 6 ppm at any time.

8. Temperature. For streams where natural temperatures do not exceed 70° F, wastes of other than natural origin shall not be discharged in amounts which will result in an increase of more than 2° F over existing temperatures.

   For streams where natural temperatures exceed 70° F, wastes of other than natural origin shall not be discharged in amounts which will result in an increase of more than 4° F over existing temperatures.

   Maximum allowable temperatures will be established for individual streams as data becomes available. As an interim policy, the maximum allowable stream temperatures will be the maximum daily stream temperatures plus the allowable rise; provided that this temperature is not lethal to existing fish life, which is considered to be 78° F in the case of cold water fish.

9. pH. Wastes of other than natural origin shall not affect the pH of the receiving water beyond the following limits:

   a. North Platte River & Interstate Canals: Range between 7.5 and 8.5.

   b. Horse Creek: Range for pH shall be 6.5 to 8.5.

10. Coliform Bacteria. During the recreation season (May 1 through September 30), wastes or substances of other than natural origin shall not be discharged into waters designated as having limited body contact use which will cause organisms of the fecal coliform group to exceed the following limits.

    While sample data is accumulated no individual samples shall exceed the 95% confidence limit of the historical average; provided that in no case will the geometric mean of the last five consecutive samples exceed 2000 per 100 ml. (Most Probable Number), which ever is the least.

APPENDIX B

NEBRASKA WATER QUALITY CRITERIA
Applicable to the
North Platte River

NEBRASKA WATER QUALITY CRITERIA
APPLICABLE TO THE NORTH PLATTE RIVER

General Criteria

All surface waters shall meet general aesthetic standards and shall be capable of supporting desirable diversified aquatic life. These waters shall be free of substances attributable to discharges or wastes having materials that will form objectionable deposits, floating debris, oil scum and other matter producing objectionable color, odor, taste or turbidity - materials including radionuclides, in concentration or combinations which are toxic or which produce undesirable physiological responses in human, fish or other animal life or plants and substances and conditions or combinations thereof in concentrations which produce undesirable aquatic life.

Specific Criteria

1. Coliform Group Organisms. Coliform group and fecal coliform organisms shall not exceed a geometric mean of 10,000 total coliform organisms or 2,000 fecal coliform organisms per 100 milliliters. No more than 20 percent of samples shall exceed 20,000 total or 4,000 fecal coliform bacteria.

2. Dissolved Oxygen. Shall not be lower than 5 mg/1 in warm waters and 6 mg/1 in trout waters.

3. Hydrogen Ion. Hydrogen ion concentrations as expressed as pH shall be maintained between 6.5 and 9.0 with a maximum total change of 1.0 pH unit from the value in the receiving stream.

4. Temperature.

   Trout Waters - allowable change 5°
   - maximum limit 65° F.

   Warm Water Waters - allowable change 5° F May thru October
   - allowable change 10° F November thru April
   - maximum limit 90° F
   - maximum rate of change limited to 2° per hr.

5. Total Dissolved Solids. A point source discharge shall not increase the total dissolved solids concentration of a receiving water by more than 20%, this value shall not exceed 100 mg/1, and in no case shall the total dissolved solids of a stream exceed 1500 mg/1

Data regarding specific conductivity will be considered in lieu of TDS data. A point source discharge shall not increase the conductivity of the recovery water by more than 20%, this value shall not exceed 150 micromhos/centimeter, and in no case shall the conductivity of the receiving waters exceed 2250 micromhos/centimeter at 25° C.

For irrigation use the SAR value and conductivity shall not be greater than a C3-S2 class irrigation water as shown in Figure 25 of Agricultural Handbook 60.

6. Residue, Oil and Floating Substances. No residue attributable to waste water or visible film of oil or globules of grease shall be present.

   Emulsified oil and grease shall be less than 15 mg/l.

7. Aesthetic Considerations. No evidence of matter that creates nuisance conditions or is offensive to the senses of sight, touch, smell, or taste, including color.

8. Taste and Odor Producing Substances. Concentration of substances shall be less than that amount which would degrade the water quality for the designated use. Phenols concentration shall not exceed 0.001 mg/l. Shall not contain concentrations of substances which will render any undesirable taste to fish, flesh, or in any other way make such fish flesh inedible.

9. Suspended, Colloidal, or Settleable Solids. None from waste water sources which will permit objectionable deposition or be deleterious for the designated uses. In no case shall turbidity caused by waste water impart more than a 10% increase in turbidity to the receiving water.

10. Toxic and Deleterious Substances. None alone or in combination with other substances or wastes in concentration of such nature so as to render the receiving water unsafe or unsuitable for the designated use. Raw water shall be of such quality that after treatment by coagulation, filtration, sedimentation, the water will meet Public Health Drinking Water Standards. Radiological limits shall be in accordance with the Radiological Health Regulations, State of Nebraska, 1st edition 1966, and as amended in its latest edition.

    Plus ammonia nitrogen concentrations shall not exceed 1.4 mg/l in trout streams nor exceed 3.5 mg/l in warm water streams where the pH in these streams does not exceed a pH value of 8.3. If the pH of a stream exceeds 8.3, the undissociated ammonium hydroxide as nitrogen shall not exceed one-tenth mg/l in trout streams not exceed 0.25 mg/l in warm water streams.

For irrigation use, the boron concentration shall not exceed 0.75 mg/l.

For toxic materials not specified bioassay methods acceptable to Nebraska Water Pollution Control Council.